

Robotic Design for the Classroom

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Robotics

- While today's robots don't quite live up to their reputation from movies or books, they are an important part of today's technological world.
- Like dinosaurs, robots are capable of capturing the interest of children of all ages and engaging their attention in a highly technical field.
- Robotics represents a merging of multiple technical disciplines.

Gifted Thinking Skills in BEST

- Fluency – Brainstorm how to build robot to meet requirements
- Flexibility – Determine what elements of the design are required
- Originality – Create robot
- Elaboration – Add features to robot based on purpose
- Evaluation – Test and modify based on performance

Robotics Resources for Students, Teachers, and Parents

- Educational Kits
 - Robotix
 - Lego Mindstorm
 - Sony Aibo
- Robot Competitions
 - BEST
 - FIRST & FIRST Lego
 - Botball

Robotics Resources for Students, Teachers, and Parents

- NASA's Robotics Education Program (REP): robotics.arc.nasa.gov
REP works to capture the educational potential of NASA's robotics missions by supporting educational robotics competitions and events, facilitating robotics curriculum enhancements at all educational levels, and maintaining a web site clearinghouse of robotics education information.
- Robotics in the Classroom:
www.occdsb.on.ca/%7Eproj4632/index.htm
A very good Canadian site with lots of basic material on robots for both teachers and students.
- Rover Ranch: prime.jsc.nasa.gov/ROV/
The ROVER Ranch is a place to learn about robotic engineering. You can learn about the development of robots, their elements and systems, and use a 3D simulation to build and run your own robot.

Ways to Develop Robotics Skills and Background

- **Rover Ranch** – The ROVer Ranch is a place to learn about robotic engineering. You can learn about the development of robots, their elements and systems, and use a 3D simulation to build and run your own robot.

BEST Mission

- To inspire and motivate students toward studies and careers in engineering, science, and technology by providing a sports-like technology competition.
 - Problem to solve with teamwork processes
 - Setting and achieving goals within time limits
 - Managing limited resources to effect optimum solutions

BEST ROBOTICS

- BEST defines game rules and local hubs supply consumable materials for building the robot and returnable electronics and motors for controlling robots.
- Students are furnished with materials and game rules on kickoff. They have 6 weeks to develop a working robot to perform to game rules and compete.
- Points are awarded in competition and also for documentation of project in "BEST" book.
- Winners of Competition and "BEST" book compete in National playoffs at Texas A&M at College station.

BEST Book

- All real engineering projects must be properly documented.
- To ensure this part is taken seriously, a team can qualify for the national competition if their BEST book is judged to be the best in it's region (regardless of how good their robot is).
- Each team that competes in BEST must complete a book and make a short oral presentation about their robot.

School Participation

- What do the schools need to provide
 - Administration support
 - Students (5-30, 10-20 works well)
 - Faculty coaches (1-2)
 - Parent support
 - Classroom/Shop access, typically after school hours
 - Technical mentors (3-4 engineers/technicians, can be parents)

Determining the Team

**Students apply for the team
current 6th and 7th graders apply
in the spring of the previous
year. Incoming 6th graders apply
at the beginning of the year.**

**Teacher evaluations and student
input is used for determination.**

Attributes for Selection

- **Previous robotics experience – Robotix mini-course, Lego Mindstorm team, other**
- **Teamwork**
- **Cooperation**
- **Stays on Task**
- **Follows Directions**
- **Problem Solving**
- **Academics**
- **Behavior**

Skills the kids need

- BEST does not require extensive technical skills for the kids to participate
- Basic hand tools
- Simple electronics
- Most important skills are GT skills of fluency, flexibility, originality, elaboration, and evaluation.

Life Cycle for development

- Requirements – What is the robot supposed to do?
- Design – How will we make the robot meet the requirements?
- Develop – Actually building the robot, including prototype ideas
- Test – Make sure the robot actually works the way it's supposed to

Competition day

- The BEST hub committee is responsible for organizing and running the actual competition.
- Teams in the HUB all meet and bring their completed robots for competing against each other.
- It is an all day event that involves multiple rounds of competition, the presentation, and book judging for each team.

Student Perspective on Competition Day

- Students must be prepared to handle changes, problems, and challenges on the spot.
- Team spirit is important.
- Students get the opportunity to interact with other teams and their robots.
- Parent involvement is valuable in the entire process but is particularly important on this day.

Competition Day

- Each student on the team has specific job.
 - Drivers
 - Spotters
 - Pit Crew
 - Presentation
 - Strategy

Pandemonium in the Smithsonian - 2000

- The Smithsonian is on fire and the robot must turn on the Halcion Sprinklers and rescue artifacts.

RAD to the CORE - 2001

- There has been an accident at a nuclear power plant and the robot must move the reactor rods to a safe location.

Summary

- Robotics is a good topic for GT students
- It encourages higher level and GT thinking skills
- Many ways to involve students in Robotics
- BEST competition is an excellent low cost opportunity for schools to get involved with robotics.